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ABSTRACT

This curriculum implementation guide is a scope and sequence for the general section of a course in aviation maintenance technology. The course materials were prepared through a cooperative effort of airframe and powerplant mechanics, general aviation industry representatives, Federal Aviation Administration representatives, and vocational educators in Oklahoma to provide a comprehensive program in aviation maintenance technology. This implementation guide includes the following components: course sequence, course names and numbers, course hours, list of course projects, resource materials needed for each course, and a suggested tools and equipment list for the implementation of each course. A federal publication, "Federal Aviation Regulations, Part 147, Aviation Maintenance Technician Schools," is also included in this guide. (KC)

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AVIATION MAINTENANCE TECHNOLOGY

GENERAL

CURRICULUM IMPLEMENTATION GUIDE

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AVIATION MAINTENANCE TECHNOLOGY

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FOREWORD

In 1984, Tulsa County Area Vocational and Technical School met with representatives of the Oklahoma Curriculum and Instructional Materials Center (CIMC) to discuss the possibilities of developing, as a cooperative project, instructional materials designed for training aviation maintenance technicians who would make their careers in the aviation industry as FAA certified airframe and powerplant mechanics.

This publication is the result of those original discussions and the product of close coordination among airframe and powerplant mechanics, general aviation industry representatives, Federal Aviation Administration representatives, and vocational educators. This manual represents a conscious effort to meld the practical experience of personnel in the aviation industry with the best instructional methods of those in the field of vocational education.

The trainers of skilled airframe and powerplant mechanics are faced with the challenge of providing thorough and modern training to the backbone of the aviation industry: its work force. The purpose of this manual is to assist instructors in providing a high-caliber instructional program. Although the format reflects a systematic approach to instructional materials development and the latest in educational technology innovations, the information in Aviation Maintenance Technology should be adapted and modified to coincide with local conditions. To make the training process complete, the materials should be coupled with the instructor's own methods, experience, and additional materials.

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PREFACE

For many years airframe and powerplant mechanics and those responsible for training A&P mechanics have felt the need for instructional materials to be used in training. Tulsa County Area Vocational and Technical School (TCAVTS), with the cooperation and support of the Oklahoma State Department of Vocational and Technical Education, Curriculum and Instructional Materials Center (CIMC), accepted the challenge and produced a manual for use in training A&P mechanics in those areas in which they are expected to be proficient.

Aviation maintenance technology instructors are faced with the challenge of providing students with the skill and related information necessary to meet the demands of a changing profession. Competition for jobs is greater than ever. Therefore, the A&P mechanic must be better trained and better equipped to find and retain meaningful employment. This is why TCAVTS and the CIMC felt the need to develop this manual.

Instructional material in this manual is written in terms of student performance, using measurable behavioral objectives. This is an innovative approach to teaching that accents and augments the teaching/learning process. Criterion-referenced evaluation instruments and practical skill test instruments provide for a uniform measurement of student progress.

The purpose of this manual is to assist aviation maintenance technology instructors in providing instruction throughout the industry. This publication should be supplemented by each instructor's methods and materials. Information in this manual has been carefully developed to be in accordance with the Federal Aviation Administration requirements for certificated schools under Federal Aviation Regulation 147 (see Appendix E) and to meet industry standards as established by a statewide advisory committee. Therefore, modification of these materials for the purpose of training A&P mechanics should be carefully considered. However, because of the versatility of the materials, they can be modified to meet training needs for refresher courses or special courses offered by an instructor. To meet these special needs any information in this manual that does not concur with the instructor's course of study should be modified to meet specific needs.

ACKNOWLEDGEMENTS

Appreciation is expressed to the many individuals who contributed their time, talents, and knowledge in the preparation of this manual.

Thank you to the following Oklahoma Advisory Committee members, staff representatives of Tulsa County Area Vocational and Technical School, and the staff of the Oklahoma State Department of Vocational and Technical Education.

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USE OF THIS PUBLICATION

CURRICULUM DESIGN

Aviation Maintenance Technology instructional materials are presented in five publications for each section: General, Airframe, and Powerplant. These publications are as follows: Curriculum Implementation Guide, Instructor Guide, Student Guide, Course Test Booklet, and the Course Test Answer Document.

The Curriculum Implementation Guide is a GBC-bound scope and sequence of each Section, including General, Airframe, and Powerplant. Components included are course sequence, course names and numbers, course hours, list of course projects, resource materials needed for each course, and a suggested tools and equipment list for the implementation of each course.

The Instructor Guide contains all the components found in the student materials, as well as a table of contents for the entire instructor guide, module contents, instructor's module implementation guide, answers to the theory test, workbook supplements, and the course test answer templates.

The Student Guide contains the module title page, module introduction and module objective, specific objectives, technical information supplements, transparency masters, workbook supplements, project guides, theory test, and practical test.

The course test is designed to be given to the students upon the completion of an entire course. Questions for the course test are taken from the FAA written test guide. The specific objectives serve as a guide in the selection of the course test questions. An answer template is designed for each course test to ease the instructor's grading process. The course tests are designed to be non-consumable items. The student answer document is designed for the student to answer the course test. The student answer document is a consumable product, therefore, it is necessary for every student to have an answer document.

INSTRUCTIONAL MODULES

The General Section of the Aviation Maintenance Technology instructional materials contains five courses and nineteen instructional modules. The instructional modules are built around Aviation Maintenance Publishers, Inc., (AMP) Aviation Maintenance Technician Training Series. To supplement, when necessary, and guide the instructor through the AMP training series the following nine basic components were established to form a module of instruction:

A. Module Introduction and Module Objective
B. Performance Objectives
C. Instructor's Module Implementation Guide
D. Technical Information Supplements
E. Workbook Supplements
F. Project Guides
G. Theory Test
H. Answers to Theory Test and Workbook Supplements
I. Practical Test

Depending on the specific objectives and the AMP training series, an instructional module may or may not include all module components.

All of the module components "zero in" on measurable and observable learning outcomes. Teachers are encouraged to supplement, personalize, localize, and motivate with these materials in order to develop a complete teaching/learning process.

Modules of instruction are designed for use in more than one lesson or class period of instruction. Careful study of each module of instruction by the teacher will help him or her to determine the following

- Amount of material that can be covered in each class period
- Skills that must be demonstrated
- Supplies and equipment needed
- Amount of practice needed
- Amount of class time needed for demonstration
- Supplementary materials, such as pamphlets and filsmstrips, that must be ordered
- Resource people to contact

MODULE INTRODUCTION

Each module of instruction begins with a module introduction. The module introduction is to be used as a student motivator and tells the student why the aviation maintenance technician needs to know the information outlined in the specific module of instruction.

PERFORMANCE OBJECTIVES

A module of instruction is based on the performance needed for successful employment as an aviation maintenance technician and on the training requirements set forth by the Federal Aviation Administration (FAA). Performance objectives are stated in two forms: module objectives, stating the subject matter to be covered in a module of instruction; and specific objectives, stating the performance necessary to reach the module objective. Since the objectives of the module provide direction for the teaching/learning process, it is important that the teachers and students have a common understanding of the intent of the objectives.

The specific objective sheet has three major parts: the specific objective, stating the performance necessary; the learning level, which is placed in parentheses at the end of the specific objective; and the reference needed for the technical information to implement the objectives.

EXAMPLE:	1. Name the principal characteristics of ferrous and non-ferrous metals.(1)	EA-ITP-G	6:I:34-36
		AC-43.13A	129-130
		Technical Supplement #1	

Learning levels are identified as 1, 2, or 3. The following are definitions of each level:

A. Level 1 requires:

1. Knowledge of general principles, but no practical application
2. No development of manipulative skill
3. Instruction by lecture, demonstration, and discussion

B. Level 2 requires:

1. Knowledge of general principles, and limited practical application
2. Development of sufficient manipulative skill to perform basic operation
3. Instruction by lecture, demonstration, discussion, and limited practical application

C. Level 3 requires:

1. Knowledge of general principles, and performance of a high degree of practical application
2. Development of sufficient manipulative skill to accomplish return to service
3. Instruction by lecture, demonstration, discussion, and a high degree of practical application

The reference section of the specific objective sheet tells the student and the instructor where to find the technical content for that specific objective and whether workbook assignments, workbook supplements, or project guides apply to the specific objective:

EXAMPLE: EA-ITP-G 6:I:34-36

The first set of letters is the Aviation Maintenance Publishers, Inc., Training Series publication code. The first digit is the book number within the reference, the second digit is the section number, and the third digit is the page number. The reference section may also refer to FAA publications, service manuals, technical information supplements, workbook supplements, or project guides.

The objective sheet should be given to students and referred to throughout the teaching/learning process. This will help answer any questions concerning performance requirements for each instructional module. The objectives can also help determine teaching strategies and instructional methods. Prepare for each module by deciding how each objective can best be taught.

The objective sheet may also be used as a quick pretest to determine students' prior knowledge and to determine whether further study or activities are necessary. Teachers should feel free to modify, delete, or add objectives in order to meet the needs of the students and community. When changes in objectives are made, the teacher should remember to supply the needed information, workbook supplements and/or project guides, and criterion test items.

INSTRUCTOR'S MODULE IMPLEMENTATION GUIDE

The instructor's module implementation guide is included in the teacher guide. The module implementation guide includes materials to supplement the module, implementation suggestions, and instructional supplements. A module implementation guide may or may not include materials to supplement the module or instructional supplements.

The materials to supplement the module are materials the instructor may want to order prior to teaching the module. It may include films, videotapes, pamphlets, and reference books.

The implementation suggestions provide suggestions for delivery and/or presentation during the instructional process. The estimated teaching time should be completed by the instructor prior to the teaching process and then finalized after teaching that specific objective.

The module implementation guide may also include instructional supplements. Instructional supplements may consist of motivational materials, review or practice materials such as crossword puzzles and self-tests, or charts and reference materials. Instructional supplements are designed to be copied and distributed to individual class members or to the class as a whole. Suggestions for their use are included in the implementation suggestions. Transparencies direct the class' attention to the topic of discussion. Transparencies may present new information, or they may reinforce information presented in the technical information. They are particularly effective when identification or analysis is necessary.

TECHNICAL INFORMATION SUPPLEMENTS

The technical information sheet provides "must know" content essential for meeting the cognitive (knowledge level) objectives of the module. The technical information supplements are designed to supplement the AMP General Textbook and are keyed to the specific objectives.

Students should read the technical information supplements before the information is discussed in class. Space is provided in margins for students and teachers to add notes that supplement, localize, personalize, or provide motivation for each module.

WORKBOOK SUPPLEMENTS

Workbook supplements give students a chance at problem solving, self-assessment, and/or practical experience. They assist students in the application of knowledges that are necessary prerequisites to skill development. Workbook supplements may be given to the student for completion in class or may be used for homework assignments. Answer sheets are provided when appropriate and can be used by the student and teacher for checking student progress. The scores of those workbook supplements listed in the specific objectives should be averaged with the module test scores, as the skills addressed in these workbook supplements are considered necessary in meeting the module objective. The workbook supplements are supplemental to the AMP General Workbook.

PROJECT GUIDES

Project guides are another important segment of a module of instruction. The project guides provide a list of equipment, required references, tools, and materials needed to complete a manipulative or psychomotor skill. They describe a step-by-step procedure needed to complete each task or job. Diagrams, photographs, and illustrations are provided to assist students in achieving the skill.

The teacher should demonstrate to students the procedures outlined in each project guide. Furthermore, the teacher needs to localize the project guide to the equipment and supplies available in the local lab or shop situation. Project guides also furnish potential employers with a picture of the skills being taught and the performance they might reasonably expect from a person who has had this vocational instruction.

Project guide performance should be evaluated by the instructor and averaged with the module test scores, as the skills addressed in the project guides are considered necessary in meeting the module objective.

THEORY TEST

The theory test provides criterion-referenced evaluation of every objective listed in the unit of instruction. The theory test provides evaluation of the student's cognitive knowledge related to the module. The acceptable response on a theory test, 85 percent, may be raised or lowered to fit the topic or the student's ability level. The percentage score applies to the overall score, not to each question. In some instances, an instructor may want to test over three or four objectives at a time instead of testing all objectives upon completion of the module.

ANSWERS TO THEORY TEST AND WORKBOOK SUPPLEMENTS

Answers to the theory test and the workbook supplements are components designed to assist the teacher in evaluation of student performance.

PRACTICAL TEST

The practical tests provide evaluation for specific psychomotor skills. A practical test may be an evaluation of one psychomotor skill or a combination of several psychomotor skills. Scoring of the practical test is based on two factors: the student's performance level and the degree of importance of each test item. Every practical test will tell the students the acceptable passing score and the test items on which the student must achieve a perfect score.

Each practical test includes an instructor's guide and a student guide. The instructor's guide sets forth guidelines the instructor should follow before, during and after giving the test. The student guide provides the student with an introduction to the practical test and serves as a student answer sheet as needed.

COURSE, MODULE, AND PAGE NUMBERS

The Aviation Maintenance Technology instructional materials are arranged by courses. Each course has been given a number that is keyed to the section, material revision number and the teaching sequence of the courses.

EXAMPLE: G101 Mathematics and Physics

Every course with a "G" and the first digit "1" is a general course. The second digit in the course number represents the course revision number. When the materials are revised the digit will change from "0" to "1". The third digit in the course number represents the teaching sequence of that course, for example, G101 should be the first course taught.

The module numbers repeat the course number with the addition of a letter. The letter represents the teaching sequence of the module within the course, for example, G101-A is the first module to be taught in the first course.

Each publication from the Curriculum and Instructional Materials Center (CIMC) is assigned a specific abbreviation. For example, the first module to be taught in the first course is abbreviated G101-A. An example of a page number is G101A-1. Since CIMC publications are loose leaf, this system of page numbering was adopted so that pages from different manuals would not get mixed up.

METHODS OF DISSEMINATING MATERIAL

Materials may be given out a module or page at a time to keep the material before the student always new. Some teachers ask students to furnish a three-ring binder for each module. This is convenient for taking the materials home to study. Upon completion, each module is then placed in a larger binder. The large binders may be purchased at cost from the CIMC. Some teachers store the materials by modules in filing cabinets or boxes until needed. All the modules may be given out at once if desired.

For best results, provide student materials for each student. Student materials contain everything but the test answers, answers to workbook supplements, module implementation guide and practical instructor's guide. All tests are collated at the back of student material and should be removed and stored until needed.

TEACHING METHODS

It is a challenge to keep students motivated. Supplement the objectives by providing the "why," personal experiences, and current information. Prepare for each module by deciding how each objective can best be taught. Allow students to become involved in preparing and planning.

CORRECTIONS AND SUGGESTIONS

The Curriculum and Instructional Materials Center (CIMC) wants to provide vocational instructors and students with materials that are accurate and effective. Although the CIMC strives to maintain the highest standards of development and production, oversights occasionally do occur. If you find any errors in this or other CIMC publications, or have suggestions for improving their usefulness in vocational programs, please notify the CIMC staff. One easy way of pointing out errors is to make a photocopy of the affected page and to indicate the correction on the copy. You can mail the information to the CIMC, where it will be used to correct the publication before the materials are reprinted.

To ensure that the material is updated on a timely basis, it is important that you notify the CIMC of necessary corrections as soon as possible after discovering the error. Do not assume that someone else will notice the error and inform the CIMC; other users may be making the same assumption. Please send corrections and recommendations for improving this publication to the following address:

Manager of Development
Curriculum and Instructional Materials Center
Oklahoma State Department of Vocational
and Technical Education
1500 West Seventh
Stillwater, OK 74074

APPENDIX A

GENERAL
AVIATION MAINTENANCE TECHNOLOGY
COURSE SCOPE AND SEQUENCE

COURSE			HOURS	
G101	Aviation Mathematics and Physics			60
	G101-A	Solve Problems Using Principles of Mathematics	30	
	G101-B	Solve Problems Using Principles of Physics	30	
G102	Fundamentals of Aircraft Maintenance			66
	G102-A	Identify Basic Components of Aircraft	6	
	G102-B	Identify, Clean, and Treat Corroded Aircraft Structures	18	
	G102-C	Interpret Blueprints and Drawings and Draw Sketches	18	
	G102-D	Identify Structural Materials and Perform Basic Material Processes	24	
G103	Fundamentals of Regulations, Publications, and Records			45
	G103-A	Select and Use Regulations, Publications, and Records	15	
	G103-B	Exercise Mechanics' Privileges and Limitations	15	
	G103-C	Document Aircraft Records	15	
G104	Technical Mechanics			150
	G104-A	Perform Ground Handling and Servicing	40	
	G104-B	Use Hand and Power Tools and Precision Measuring Instruments	20	
	G104-C	Identify and Select Aircraft Hardware	40	
	G104-D	Fabricate and Install Rigid and Flexible Fluid Lines	20	
	G104-E	Compute and Record Aircraft Weight and Balance	30	

APPENDIX A

COURSE			HOURS	
G105	Aviation Electricity and Electronics			129
	G105-A	Determine the Relationship of Voltage, Current, and Resistance in Electrical Circuits	60	
	G105-B	Compute and Measure Capacitance and Inductance	6	
	G105-C	Measure Voltage, Current, Resistance and Continuity	30	
	G105-D	Read and Interpret Electrical Circuit Diagrams	15	
	G105-E	Inspect and Service Batteries	18	

APPENDIX B

AVIATION MAINTENANCE TECHNOLOGY
GENERAL SECTION
REFERENCE LIST

The following list of references will be used when implementing these instructional materials into your curriculum. The list is divided into two sections: Required Student References and Classroom References. A copy of every reference documented should be included in your technical library.

I. Required Student References

(NOTE: One copy of each of the following materials should be made available for every student.)

A. EA-ITP-GB General Textbook

B. EA-ITP-GW-B General Workbook

C. EA-ITP-GSG-B General Study Guide

D. EA-ITP-GIG-B General Instructor's Guide

E. EA-AC 65-9A Airframe and Powerplant Mechanics General Handbook

F. EA-AC 65-12A Airframe and Powerplant Mechanics Powerplant Handbook

G. EA-AC 65-15A Airframe and Powerplant Mechanics Airframe Handbook

H. EA-FAA-T-808010C Aviation Mechanics General Question Book Including Answers and Explanations

I. A-ATD-2 Aircraft Technical Dictionary, 2nd edition

J. EA-282-0 Standard Aviation Maintenance Handbook

(NOTE: The above materials are available from Aviation Maintenance Publishers, Inc., 1000 College View Drive, Riverton, Wyoming 82501. [800] 443-9250.)

K. Standard Aircraft Handbook

(NOTE: This book is available from Aero Publishers, Inc., 329 West Aviation Road, Fallbrook, California 92208).

APPENDIX B

II. Classroom References

(NOTE: One copy of each of the following references should be made available for every four students.)

A.	EA-BAL	Aircraft Weight and Balance
B.	EA-AS	Applied Science for Aviation Technicians
C.	EA-IAR	Aircraft Inspection and Maintenance Records
D.	EA-BE-1	Basic Electricity
E.	EA-BEM	Basic Electronics and Radio Installation
F.	EA-AC 43-3	Nondestructive Testing in Aircraft
G.	EA-CC-1	Aircraft Corrosion Control
H.	EA-AB-1	Aircraft Batteries (Lead-acid and Ni-cad)
I.	EA-AC 43-13, 1A & 2A	Aircraft Inspection, Repair, and Alteration Handbook
J.	EA-AHS-1	Aviation Maintenance Handbook and Standard Hardware Digest
K.	EA-UFR	Understanding the Federal Air Regulations
L.	AC 43-7	Ultrasonic Testing of Aircraft
M.	ISBN 0-89100-059-3	Preventive Maintenance for Pilots and Aircraft Owners

(NOTE: The above materials are available from Aviation Maintenance Publishers, Inc., 1000 College View Drive, Riverton, Wyoming 82501. [800] 443-9250.)

N. Micrometers, Calipers, and Gages

O. Torque and Torque Wrenches

(NOTE: The above books are available from Hobar Publications, 1234 Tiller Lane, St. Paul, Minnesota 55112.)

P. General Aviation Ground Operations Safety Handbook

Q. Aviation Ground Operation Safety Handbook, 3rd edition

(NOTE: The above books are available from the National Safety Council, 444 North Michigan Avenue, Chicago, Illinois 60611.)

APPENDIX C

AVIATION MAINTENANCE TECHNOLOGY
GENERAL SECTION
RECOMMENDED STUDENT TOOL LIST

1. Ratchet, 1/4" drive
2. Extension, 1/4" drive, 2"
3. Extension, 1/4" drive, 6"
4. Socket, 1/4" drive, 7/32", 12 point
5. Socket, 1/4" drive, 1/4" 12 point
6. Socket, 1/4" drive, 9/32", 12 point
7. Socket, 1/4" drive, 5/16", 12 point
8. Socket, 1/4" drive, 11/32", 12 point
9. Socket, 1/4" drive, 3/8", 12 point
10. Socket, 1/4" drive, 7/16", 12 point
11. Socket, 1/4" drive, 1/2", 12 point
12. Socket, 1/4" drive, 9/16", 12 point
13. Wrench, combination, 5/16", 12 point
14. Wrench, combination, 11/32", 12 point
15. Wrench, combination, 3/8", 12 point
16. Wrench, combination, 7/16", 12 point
17. Wrench, combination, 1/2", 12 point
18. Wrench, combination, 9/16", 12 point
19. Wrench, combination, 5/8", 12 point
20. Wrench, combination, 11/16", 12 point
21. Wrench, combination, 3/4", 12 point
22. Diagonal cutter, 6"
23. Plier, duck bill, 7 3/4"
24. Pin punch 3/32"
25. Pin punch 1/8"
26. Pin punch 5/32"
27. Hacksaw frame
28. Combination square, 12"
29. Hammer, ball peen, 12 oz.
30. Screwdriver, common, 4"
31. Screwdriver, common, 6"
32. Screwdriver, common, 8"
33. Screwdriver, Phillips #2, 1 1/2"
34. Screwdriver, Phillips #2, 6"
35. Rule, 6", steel
36. File, mill, 10"
37. Tool chest
38. Multimeter

GENERAL EQUIPMENT, TOOLS, MATERIALS, AND SUPPLIES LIST

	G102-B #1	G102-B #2	G102-D #1	G102-D #2	G102-D #3	G102-D #4	G102-D #5	G104-A #1	G104-A #2	G104-A #3	G104-A #4	G104-B #1	G104-B #2	G104-B #3	G104-B #4	G104-B #5	G104-C #1	G104-C #2	G104-C #3	G104-D #1	G104-D #2	G104-D #3	G104-D #4	G104-D #5	G104-D #6	G104-D #7	G104-E #1	G104-E #2	G104-E #3	G105-C #1	G105-C #2	G105-C #3	G105-C #4	G105-C #5	G105-C #6	G105-C #7	G105-C #8	G105-E #1	G105-E #2
MEASURING TOOLS																																							
6" Rule																		X																					
AN Bolt Gage																		X																					
Grip Length Gage																		X																					
Thread Pitch Gage																		X																					
Terminal Gage																	X																						
Steel Rule												X						X																					
25' Steel Tape Measure																	X										X	X	X										
Surface Plates													X	X																									
1"Vernier Micrometer												X								X																			
Inside Micrometer/extension rods													X																										
Depth Micrometer/extension rods														X																									
6" or 8" Universal Vernier Caliper															X																								
Comb. Square Head and Blade																X																							
Drill Gages																X																							
12" Steel Rule																																							
Machinist Square																					X		X	X															
Chalk Line																											X	X	X										
Plumb Bob																											X	X	X										
Spirit Level																											X	X	X										
SAFETY EQUIPMENT																																							
10 lb. Fire Extinguisher (2)									X																														
10 lb. Halon Fire Extinguisher										X																													
Rubber Gloves—1 per student	X	X																																				X	X
Rubber Apron—1 per student	X	X																																				X	X
Safety Glasses—1 per student	X	X	X	X		X																																X	X
Face Shield—1 per student			X																																			X	X
Non-Flammable Apron—1 per student			X																																				
Shoe Coverings—1 per student			X																																				
Asbestos Gloves—1 per student			X																																				

GENERAL EQUIPMENT, TOOLS, MATERIALS, AND SUPPLIES LIST

	G102-B #1	G102-B #2	G102-D #1	G102-D #2	G102-D #3	G102-D #4	G102-D #5	G104-A #1	G104-A #2	G104-A #3	G104-A #4	G104-B #1	G104-B #2	G104-B #3	G104-B #4	G104-B #5	G104-C #1	G104-C #2	G104-C #3	G104-D #1	G104-D #2	G104-D #3	G104-D #4	G104-D #5	G104-D #6	G104-D #7	G104-E #1	G104-E #2	G104-E #3	G105-C #1	G105-C #2	G105-C #3	G105-C #4	G105-C #5	G105-C #6	G105-C #7	G105-C #8	G105-E #1	G105-E #2
Dust Mask—1 per student				X																																			
Ear Protection—1 per student									X																														
TOOLS																																							
Tongs			X																																				
Utility Knife				X																																			
Flashlight							X																																
Shears				X																																			
Mirror							X																																
Pocket Scribe																X																							
Center Punch																X																							
Sm. 3 Square File																	X																						
10" Hand File—double cut																X																							
10" Mill File—single cut																X																							
Hole Saw				X																																			
Hacksaw																X									X														
Ball Peen Hammer																X	X																						
Duckbill Pliers																X			X																				
Diagonal Pliers																			X																				
Needlenose Pliers																	X		X																				
Safety Wire Pliers																			X																				
No. Drills 30, 3, 50																X																							
Letter Drills F, U, Q																X																							
Fractional Drills—31/64, 7/16, 25/64, 1/4, 5/16, 1/8																X																							
82° Countersink																X																							
3/8" Counterbore/1/4" Morse Taper																X																							
Taper Pen Reamer/#4 Morse Taper																X																							
Tap Handles—lg. and Sm.																X																							
5/16-1/8 NC Taper Tap																X																							
7/16-14 NC Taper Tap																X																							
7/16-20 NF Taper Tap																X																							

GENERAL EQUIPMENT, TOOLS, MATERIALS, AND SUPPLIES LIST

	G102-B #1	G102-B #2	G102-D #1	G102-D #2	G102-D #3	G102-D #4	G102-D #5	G104-A #1	G104-A #2	G104-A #3	G104-A #4	G104-B #1	G104-B #2	G104-B #3	G104-B #4	G104-B #5	G104-C #1	G104-C #2	G104-C #3	G104-D #1	G104-D #2	G104-D #3	G104-D #4	G104-D #5	G104-D #6	G104-D #7	G104-E #1	G104-E #2	G104-E #3	G105-C #1	G105-C #2	G105-C #3	G105-C #4	G105-C #5	G105-C #6	G105-C #7	G105-C #8	G105-E #1	G105-E #2
¼ NPT Tap																X																							
¼ NPT Reamer																X																							
⅜-24NF Taper Tap																X																							
Die Stock																X																							
7/16-20NF Die—adjustable																X																							
1" #4 Taper Pen																X																							
Set of End Wrenches																		X		X			X		X														
Set of Allen Wrenches																																							X
Set of Combination Wrenches																										X													
¼" Drive Torque Wrench																		X																					
Set of ¼" Drive Sockets																		X																					
#2 Phillips Screwdriver																										X													
5-10X Magnifying Glass		X				X	X																																
½" Flat Cold Chisel or Cable Cutter																	X																						
Nicopress Swaging Tool																	X																						
Tubing Cutter																				X	X	X	X																
Tube Cutter/Burring Knife																								X															
Tube Flaring Tool																				X																			
Deburring Tool																				X																			
Tube Bender/5/16" Radius Form Block																					X																		
Beading Tool																						X																	
Clamping Tool																						X																	
37° Double Flare Tool																								X															
Flex. Hs. Assem. Tool or Mating AN815 adapter																									X														
Support Clamps																										X													
HARDWARE																																							
Nicopress Oval Sleeves—26-3-M or 18-3-M (4 per student)																	X																						
1/4" Cable Thimbles (4 per student)																	X																						
Shop Supply Cotter Pins																			X																				
AN818-6 B-Nuts and AN819-6 Sleeves (3 per student)																					X	X																	

GENERAL EQUIPMENT, TOOLS, MATERIALS, AND SUPPLIES LIST

	G102-B #1	G102-B #2	G102-D #1	G102-D #2	G102-D #3	G102-D #4	G102-D #5	G104-A #1	G104-A #2	G104-A #3	G104-A #4	G104-B #1	G104-B #2	G104-B #3	G104-B #4	G104-B #5	G104-C #1	G104-C #2	G104-C #3	G104-D #1	G104-D #2	G104-D #3	G104-D #4	G104-D #5	G104-D #6	G104-D #7	G104-E #1	G104-E #2	G104-E #3	G105-C #1	G105-C #2	G105-C #3	G105-C #4	G105-C #5	G105-C #6	G105-C #7	G105-C #8	G105-E #1	G105-E #2
MS-21918 Flareless Fitting (1 per student)																							X																
Flareless sleeves & Tube Nuts (2 per student)																							X																
MS21923 Flareless Fitting Type Plug (1 per student)																							X																
10-32 Screws & Nuts (10 per student)																										X													
Shop Supply AN505-526-30																X																							
7/16" Rod (2" per student)																X																							
SUPPLIES AND MATERIALS																																							
Water Hose	X																																						
Water Pail	X	X																																					
Shop Supply Soft Brushes	X																																						
Shop Supply Aluminum Wool		X																																					
Shop Supply Sponges		X																																					
Shop Supply Nylon Scrubbers		X																																					
Shop Supply Clean Shop Rags and Towels	X	X		X	X																																		
1 Large Red Flag									X																														
Shop Supply 4" Plastic Body Filler Applicator				X																																			
Shop Supply Non-explosive Cans				X																																			
Shop Supply Gray, Black, or Red Iron Oxide Suspensoid						X																																	
Shop Supply Plastic Table Covering				X																																			
Shop Supply 1 pt. Paper Mixing Cups				X																																			
Shop Supply Rib Template for Foam Core Glass Fiber Lay-Ups				X																																			
Shop Supply Wood Stir Sticks				X																																			
Shop Supply 2" Disposable Natural Bristle Brush				X																																			
Shop Supply Cutting Oil																X																							
Shop Supply Layout Stain																X																							
Shop Supply Masking Tape																	X	X																					
Shop Supply Grease																				X																			
Shop Supply Light Oil																									X														
Shop Supply Grease Pencils																									X														
Shop Supply Fine Grit Sand Paper																								X															

GENERAL EQUIPMENT, TOOLS, MATERIALS, AND SUPPLIES LIST

	G102-B #1	G102-B #2	G102-D #1	G102-D #2	G102-D #3	G102-D #4	G102-D #5	G104-A #1	G104-A #2	G104-A #3	G104-A #4	G104-B #1	G104-B #2	G104-B #3	G104-B #4	G104-B #5	G104-C #1	G104-C #2	G104-C #3	G104-D #1	G104-D #2	G104-D #3	G104-D #4	G104-D #5	G104-D #6	G104-D #7	G104-E #1	G104-E #2	G104-E #3	G105-C #1	G105-C #2	G105-C #3	G105-C #4	G105-C #5	G105-C #6	G105-C #7	G105-C #8	G105-E #1	G105-E #2
Shop Supply 500 Grit Wet or Dry Sand Paper																				X	X	X	X																
Shop Supply Lubriplate Grease																						X																	
Shop Supply Crocus Cloth																						X																	
Shop Supply 5606 Hydraulic Fluid																							X																
Shop Supply Material for Marking A/C Taxiing Course											X																												
Shop Supply Clark Brand Polyurethane Foam (¼" x 8" x 24" piece per student)				X																																			
Shop Supply Plain Weave 6 oz. Glass Fiber Cloth				X																																			
Shop Supply ⅛" 7x7 Carbon Steel Cable																	X				X																		
Shop Supply Aluminum Tubing ⅜" Gage (14" per student)																				X																			
Shop Supply Aluminum Tubing O.D.⅜" (13" per student)																								X															
Shop Supply ⅜" O.D. Aluminum or Steel Tubing (9½" per student)																						X																	
Shop Supply 6061-T6 Aluminum Tubing (8" per student)																							X																
Shop Supply 5052-0 ¼" Aluminum Tubing 0.028" Wall Thickness																								X															
Shop Supply Flexible Hose																							X																
Shop Supply 0.032" Stainless Steel Safety Wire																X			X																				
Shop Supply ¼" Nylon Rope								X		X																													
Shop Supply 2330 Commercial Grade Flat Stock Steel (2"x2" per student)			X	X																																			
Shop Supply 4130 Commercial Grade Flat Stock Steel (2"x2" per student)					X																																		
Shop Supply 2024 Flat Stock-0.032' non-clad (2—2"x2" per student)					X																																		
Shop Supply Cold Rolled Steel or Aluminum Blocks (½" x 2" x 3-5/16" per student)																X																							
CHEMICALS																																							
Baking Soda																																						X	
Eldorado ED-500		X																																					
Zinc Chromate Primer		X																																					
Doradokote #7		X																																					
Eldorado AC-12		X																																					
Vinyl Ester Resin (1 pt. per student)				X																																			
Methyl Ethyl Ketone Peroxide				X																																			
Thixotropic Agent (Aerosaal or Microballoons)				X																																			
Methyl Ethyl Ketone (Sufficient for Clean-up)				X																																			

GENERAL EQUIPMENT, TOOLS, MATERIALS, AND SUPPLIES LIST

	G102-B #1	G102-B #2	G102-D #1	G102-D #2	G102-D #3	G102-D #4	G102-D #5	G104-A #1	G104-A #2	G104-A #3	G104-A #4	G104-B #1	G104-B #2	G104-B #3	G104-B #4	G104-B #5	G104-C #1	G104-C #2	G104-C #3	G104-D #1	G104-D #2	G104-D #3	G104-D #4	G104-D #5	G104-D #6	G104-D #7	G104-E #1	G104-E #2	G104-E #3	G105-C #1	G105-C #2	G105-C #3	G105-C #4	G105-C #5	G105-C #6	G105-C #7	G105-C #8	G105-E #1	G105-E #2
Liquid Penetrant Kits					X																																		
Boric Acid Solution																																							X
Distilled Water																																							X
EQUIPMENT																																							
A/C with MFG. Service Manuals & Papers	X	X						X	X	X	X																X	X	X										
2 Heat Treating Furnaces			X																																				
2 Rockwell Hardness Testers			X																																				
2 Quench Tanks/quenching oil			X																																				
Magnetic Particle Inspection Machine/Manual						X																																	
Aircraft Engine Crankshaft, Cleaned & Decarbonized						X																																	
Standard Magnetic Field Indicator						X																																	
A C Coil						X																																	
Small Welded Aircraft Structure							X																																
Band Saw				X																																			
Electrical Auxiliary Power Unit										X																													
Bench Vise																X							X	X	X														
Drill Vise & Back-Up Block																X																							
Drill Press																X																							
½" High Speed Machine Reamer																X																							
Pneumatic Power Drills																																							
Pressure Tube Tester																				X			X																
Install. Mock-up or A/C Engine/Rigid Tubing and Flexible Hose Type Plumbing																										X													
Tube & Hose Assemblies for Mock-up or Engine																										X													
Certified Scales and Chocks																											X		X										
Certified Electronic Load Cells																												X											
Aircraft Jacks																											X	X											
Ramps																													X										
Work Benches				X																																			
Degreased & Decarbonized Pistons (1 per student)					X																																		
A/C Chocks for each aircraft			X	X																							X		X										

GENERAL EQUIPMENT, TOOLS, MATERIALS, AND SUPPLIES LIST

	G102-B #1	G102-B #2	G102-D #1	G102-D #2	G102-D #3	G102-D #4	G102-D #5	G104-A #1	G104-A #2	G104-A #3	G104-A #4	G104-B #1	G104-B #2	G104-B #3	G104-B #4	G104-B #5	G104-C #1	G104-C #2	G104-C #3	G104-D #1	G104-D #2	G104-D #3	G104-D #4	G104-D #5	G104-D #6	G104-D #7	G104-E #1	G104-E #2	G104-E #3	G105-C #1	G105-C #2	G105-C #3	G105-C #4	G105-C #5	G105-C #6	G105-C #7	G105-C #8	G105-E #1	G105-E #2
3 Tiedown Anchors per aircraft								X																															
Engine Intake Covers								X																															
Pitot Tube & Static Port Covers								X																															
Control Batten for Ailerons, Rudder & Elevator								X																															
2 way Radio									X																														
Bull Horn									X																														
6 Stanchions (4' in Height)										X																													
Air Hoses, Gages, & Nozzle Attachments						X																				X	X	X											
SPECIAL MATERIALS*																																							
Assort. Dowell Pins/Colored ends (5 per student)												X																											
Pre-Machined 6" Pipe and 4" Pipe (Outlined G104-B PG# 2)													X																										
Pre-Machines Steel or Aluminum Block (Outlined G104-B PG# 3)														X																									
Pre-Machined Steel Bar Turned/4 Dimensions (Outlined G104-B PG# 4)															X																								
Pre-Machines Steel Drilled & Bored (Outlined G104-B PG# 4)															X																								
Project Kit (Outlined G104-B PG# 5)																X																							
Hardware Board & Accessory Box (Outlined G104-C PG# 2 & # 3)																		X	X																				
Electrical Project Boards (Outlined G105-C)																														X	X	X	X	X	X	X			

*Before the project guides using these materials can be used, it will be necessary to have these materials built. All plans or drawings for the materials are included in the module in which they are used.

GENERAL EQUIPMENT, TOOLS, MATERIALS, AND SUPPLIES LIST

	G102-B #1	G102-B #2	G102-D #1	G102-D #2	G102-D #3	G102-D #4	G102-D #5	G104-A #1	G104-A #2	G104-A #3	G104-A #4	G104-B #1	G104-B #2	G104-B #3	G104-B #4	G104-B #5	G104-C #1	G104-C #2	G104-C #3	G104-D #1	G104-D #2	G104-D #3	G104-D #4	G104-D #5	G104-D #6	G104-D #7	G104-E #1	G104-E #2	G104-E #3	G105-C #1	G105-C #2	G105-C #3	G105-C #4	G105-C #5	G105-C #6	G105-C #7	G105-C #8	G105-E #1	G105-E #2
MATERIALS FOR ELECTRICAL PROJECTS																																								
Student Multimeter (1 per student)																															X	X	X	X	X	X	X		X
Resistors*																														X		X	X	X*	X	X	X		
Colored Wires**																															X								
Black Lead Wires																														X			X	X					
Red Lead Wires																														X			X	X		X			
Constant Current Battery Charger																																						X	X
12V Lead-Acid A/C Battery																																						X	
Rubber Suction Ball																																						X	X
Hydrometer																																						X	
Thermometer																																						X	
Cell Puller																																							X
Ni-Cad Battery																																							X
Shorting Straps																																							X

***RESISTORS**

G105-C #1		G105-C #3	G105-C #4	G105-C #5	G105-C #6	G105-C #7	G105-C #8
1. R_1 - 47 Ω	7. R_7 - 1000 Ω	1. R_1 - 47 Ω	1. R_1 - 1000 Ω	1. R_1 - 47 Ω	1. R_1 - 1100 Ω, 1 watt	1. R_1 - 47 Ω, 1 watt	1. R_1 - 390 Ω, 1 watt
2. R_2 - 560 Ω	8. R_8 - 1500 Ω	2. R_2 - 560 Ω	2. R_2 - 1500 Ω	2. R_2 - 1100 Ω	2. R_2 - 10,000 Ω, 1 watt	2. R_2 - 560 Ω, 1 watt	2. R_2 - 1100 Ω, 1 watt
3. R_3 - 1100 Ω	9. R_9 - 1100 Ω	3. R_3 - 1100 Ω	3. R_3 - 1500 Ω	3. R_3 - 1100 Ω	3. R_3 - 4700 Ω, 1 watt	3. R_3 - 47 Ω, 1 watt	3. R_3 - 560 Ω, 1 watt
4. R_4 - 4700 Ω	10. R_{10} - 470 Ω	4. R_4 - 4700 Ω	4. R_4 - 4600 Ω	4. R_4 - 470 Ω		4. R_4 - 1100 Ω, 1 watt	
5. R_5 - 3300 Ω	11. R_{11} - 10,000 Ω	5. R_5 - 33,000 Ω					
6. R_6 - 1000 Ω	12. R_{12} - 390 Ω						

****COLORED WIRES** - One end collared and the other end non-collared on each wire

1. Black 2. Brown 3. Red 4. Orange 5. Yellow 6. Green 7. Blue 8. Violet 9. Gray 10. White

APPENDIX D

COURSE IMPLEMENTATION GUIDE

The purpose of the Aviation Maintenance Technology instructional materials is to assist instructors in providing quality instruction throughout industry. Due to the versatility of the materials they can be modified to meet training needs for refresher courses or special courses offered by an instructor. For this reason the materials may be purchased by courses. This appendix outlines the reference materials, tools, and equipment necessary to implement a specific course.

G101 - MATHEMATICS AND PHYSICS

A. References

1. EA-ITP-G General Textbook

2. EA-ITP-GW General Workbook

(NOTE: Required - One per student)

B. Videotapes

1. Newton's Law of Motion, ITP-G1, Program 3

2. Energy, Work, Power, and Force, ITP-G1, Program 2

3. Temperature, Pressure, and Fluids, ITP-G1, Program 4, Part 1 - Gases

4. Temperature, Pressure, and Fluids, ITP-G1, Program 4, Part 1 - Liquids

5. Bernoulli's Principle - Why an Airplane Flies, ITP-G1, Program 5

(NOTE: The above references and videotapes are available from Aviation Maintenance Publishers, Inc., P.O. Box 36, 1000 College View Drive, Riverton, Wyoming 82501.)

S101 - SAFETY

(NOTE: Since safety should be taught before any work in the lab or shop area, S101-A General Hangar and Shop Safety has been included with course G101. Every student should be required to complete the safety module before continuing to the next course, regardless of the student's industry experience or knowledge of safety practices.)

APPENDIX D

A. Pamphlets

1. Lift Safely. Recommended: One per student

2. How Good Housekeeping Helps You. Recommended: Minimum one for every two students

3. Facts About Backs. Recommended: One per student

4. The Disablers: Know Your Four Worst Enemies. Recommended: Minimum one for every two students

5. Protect Your Eyes. Recommended: One per student

6. Using Hand Tools and Portable Power Tools Safely. Recommended: One per student

(NOTE: The above pamphlets are available from the National Safety Council, 444 North Michigan Avenue, Chicago, Illinois 60611.)

7. 10 Good Reasons to Protect Your Hands. Recommended: One for every two students

(NOTE: Available from Channing L. Bete Co., Inc., Greenfield, Massachusetts 01301.)

8. This is How Most Fire Extinguishers Work. Recommended: One for every two students

(NOTE: This is available from the National Fire Protection Associates, Batterymarch Park, Quincy, Massachusetts 02699.)

B. Films

1. Safety Attitude

2. Safety Odds of See . . . Think . . . Do

3. A New Way To Lift

4. Using Fire Extinguishers

(NOTE: The above films are available from the National Safety Council, 444 North Michigan Avenue, Chicago, Illinois 60611.)

5. Moods in Safety

(NOTE: This is available from National Audiovisual Center, National Archives and Records Service, General Services Administration, Washington, DC 20409.)

APPENDIX D

C. Safety stickers

(NOTE: Safety stickers are available from the National Safety Council, 444 North Michigan Avenue, Chicago, Illinois 60611; and from the Oklahoma State Department of Vocational and Technical Education, 1500 West Seventh Avenue, Stillwater, Oklahoma 74074.)

APPENDIX D

COURSE IMPLEMENTATION GUIDE

G102 - FUNDAMENTALS OF AIRCRAFT MAINTENANCE

A. Project Guides:

1. G102-B - #1 Perform Aircraft Cleaning
(Recommended: 6 students per aircraft)

2. G102-B - #2 Perform Aircraft Corrosion Control
(Recommended: 6 students per aircraft)

3. G102-D - #1 Perform Basic Heat-Treating
(Recommended: Students perform individually)

4. G102-D - #2 Perform a Foam Core/Glass Fiber Lay-up
(Recommended: Students perform individually)

5. G102-D - #3 Perform a Liquid-Penetrant Inspection
(Recommended: Students perform individually)

6. G102-D - #4 Perform a Magnetic Particle Inspection
(Recommended: Students perform individually)

7. G102-D - #5 Perform Visual Inspections of Welded Assemblies
(Recommended: Students perform individually)

B. References:

1. EA-ITP-G General Textbook

2. EA-ITP-GW General Workbook

3. AC 43-3 Nondestructive Testing in Aircraft

4. AC 43-7 Ultrasonic Testing of Aircraft

5. AC 65-9A Airframe & Powerplant Mechanics General Handbook

6. AC 43.13-1A Acceptable Methods, Techniques, and Practices Aircraft Inspection and Repair/Aircraft Alterations

(NOTE: The above books are available from Aviation Maintenance Publishers, Inc., P.O. Box 36, 1000 College View Drive, Riverton, Wyoming 82501.)

7. Aircraft manufacturer's manuals

8. Chemical manufacturer's manuals

C. Booklets:

1. EA-CC-1 Aircraft Corrosion Control

(NOTE: This is available from Aviation Maintenance Publishers, Inc., P.O. Box 36, 1000 College View Drive, Riverton, Wyoming 82501.)

2. Cessna Air Age Education booklet: The Flying Machine: First Cousin to the Bird

(NOTE: This is available from Cessna Aircraft Co., Air Age Education, P.O. Box 1521, Wichita, Kansas 67201.)

D. Films:

1. How Airplanes Fly

2. Put Wings On Your Career

(NOTE: These are available from the FAA Film Service, Care of Modern Talking Picture, Inc., 5000 Park Street North, St. Petersburg, Florida 67201.)

E. Videotape--Aircraft Corrosion Control, EA-CC, Part 1 and 2

(NOTE: This is available from Aviation Maintenance Publishers, Inc., P.O. Box 36, 1000 College View Drive, Riverton, Wyoming 82501.)

F. Equipment and Tools

1. Rubber gloves

2. Rubber apron

3. Safety glasses

4. Face shield

5. Nonflammable aprons

6. Dust mask

7. Tongs

8. Utility knife

9. Shears (Wiss quality for fiberglass)

10. Small welded aircraft structure

11. Magnetic particle machine

12. Aircraft engine crankshaft (cleaned and decarbonized)

13. Standard magnetic field indicator

14. AC coil

15. Aircraft with manufacturer's service manual and papers

16. 2 heat treatment furnaces

17. 2 Rockwell hardness testers

18. 2 quench tanks with oil

19. Bandsaw

20. Work benches

21. Pistons (degreased and decarbonized)

22. Air hose and gages

23. Flashlight

24. Mirror

25. Hole saw

G. Supplies and Materials

1. 5-10X magnifying glass

2. Water hose

3. Soft brush

4. Water pails

5. Aluminum wool

6. Sponges

7. Nylon scrubbers

8. Shop rags and towels

9. 4 inch plastic body filler applicators

10. Nonexplosive cans
11. 1 pint paper mixing cups
12. Plastic table covering
13. Wood stir sticks
14. 2 inch disposable natural bristle brush
15. Clark brand polyeurethane foam
16. 2330 commercial grade flat stock steel (2" x 2" per student)
17. 4130 commercial grade flat stock steel (2" x 2" per student)
18. 2024 nonclad 0.032 flat stock (2-2" x 2" per student)
19. Eldorado ED-500
20. Zinc chromate primer
21. Doradokote 7
22. Eldorado AC-12
23. Vinyl ester resin
24. Methyl ethyl ketone peroxide
25. Thixotropic agent
26. Methyl ethyl ketone
27. Liquid penetrant kit
28. Rib template for foam/core glass fiber lay-up
29. Gray, black, or red iron oxide suspensoid

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COURSE IMPLEMENTATION GUIDE

G103 - FUNDAMENTALS OF REGULATIONS, PUBLICATIONS, AND RECORDS

A. References:

1. EA-ITP-GW General Workbook

2. ISBN 0-89100-059-3 Preventive Maintenance for Pilots and Aircraft Owners

3. EA-IAR Aircraft Inspection and Maintenance Records

(NOTE: These manuals are available from Aviation Maintenance Publishers, Inc., P.O. Box 36, 1000 College View Drive, Riverton, Wyoming 82501.)

B. Videotapes:

1. Aircraft 100-Hour/Annual Inspections, EA-HAS

2. Inspection and Maintenance Records, EA-IAR

(NOTE: These materials are available from Aviation Maintenance Publishers, Inc., P.O. Box 36, 1000 College View Drive, Riverton, Wyoming 82501.)

3. FAR 43 - Annual Inspection

(NOTE: This is available from the Oklahoma State Department of Vocational and Technical Education, 1500 West Seventh, Stillwater, Oklahoma 74074.)

APPENDIX D

COURSE IMPLEMENTATION GUIDE

G104 - TECHNICAL MECHANICS

A. Project Guides:

1. G104-A - #1 Perform Aircraft Tiedown
(Recommended: Students perform individually)

2. G104-A - #2 Perform as Signalperson for Taxiing Aircraft
(Recommended: Students perform in teams of 6)

3. G104-A - #3 Perform Reciprocating Engine Run-Up
(Recommended: Students perform individually)

4. G104-A - #4 Perform Aircraft Taxiing
(Recommended: Students perform individually)

5. G104-B - #1 Use the Micrometer Caliper
(Recommended: Students perform individually)

6. G104-B - #2 Use the Inside Micrometer
(Recommended: Students perform individually)

7. G104-B - #3 Use the Depth Micrometer
(Recommended: Students perform individually)

8. G104-B - #4 Use Vernier Caliper to Take Inside, Outside and Depth Measurements
(Recommended: Students perform individually)

9. G104-B - #5 Use Hand and Power Tools
(Recommended: Students perform individually)

10. G104-C - #1 Fabricate a Nicropress Oval Sleeve Cable Terminal
(Recommended: Students perform individually)

11. G104-C - #2 Identify, Select, and Install Aircraft Hardware
(Recommended: Students perform individually)

12. G104-C - #3 Safety Aircraft Hardware
(Recommended: Students perform individually)

13. G104-D - #1 Perform Tube Flaring
(Recommended: Students perform individually)

14. G104-D - #2 Perform Tube Bending
(Recommended: Students perform individually)

15. G104-D- #3 Perform Tube Beading
(Recommended: Students perform individually)

16. G104-D - #4 Fabricate Flareless Fitting Tube Assemblies
(Recommended: Students perform individually)

17. G104-D - #5 Fabricate a Double Flare
(Recommended: Students perform individually)

18. G104-D - #6 Fabricate Flexible Hose Assembly
(Recommended: Students perform individually)

19. G104-D - #7 Install Rigid and Flexible Fluid Lines
(Recommended: Students perform individually)

20. G104-E - #1 Weigh Twin-Engine Aircraft and Compute and Record Aircraft Weight and Balance (Platform Scales and Jacks)
(Recommended: Students perform as a team of 4-6)

21. G104-E - #2 Weight Twin-Engine Aircraft and Compute and Record Aircraft Weight and Balance (Electronic Load Cells)
(Recommended: Students perform as a team of 4-6)

22. G104-E - #3 Weigh Single-Engine Aircraft and Compute and Record Aircraft Weight and Balance (Platform Scales and Ramps)
(Recommended: Students perform as a team of 4-6)

B. References:

1. EA-ITP-G General Textbook

2. EA-ITP-GW General Workbook

3. AC 43.13-1A & 2A Acceptable Methods, Techniques, and Practices, Aircraft Inspection and Repair/Aircraft Alterations

4. AC 65-9A Airframe and Powerplant Mechanics General Handbook

(NOTE: The above books are available from Aviation Maintenance Publishers, Inc., P.O. Box 36, 1000 College View Drive, Riverton, Wyoming 82501.)

5. Standard Aircraft Handbook

(NOTE:. This book is available from Aero Publishers, Inc., 329 West Aviation Road, Fallbrook, California 92028.)

6. Micrometers, Calipers, and Gages

7. Torque and Torque Wrenches

(NOTE: The above books are available from Hobar Publications, 1234 Tiller Lane, St. Paul, Minnesota 55112.)

8. General Aviation Ground Operation Safety Handbook

(NOTE: This is available from the National Safety Council, 444 North Michigan Avenue, Chicago, Illinois 60611.)

9. Aircraft Manufacturer's and Flight Manuals

10. Manufacturer's manual for double flare tool

C. Booklet--Parker Hannifin Booklet: Bulletin 4306.B5 Principles of Tube Line Fabrication

(NOTE: This booklet is available from Tube Fittings Division, 17325 Euclid Avenue, Cleveland, Ohio 44112.)

D. Films:

1. Hand Prop Accident

2. Prop Strike

3. Electrostatic Grounding

(NOTE: These films are available from Jay Nelson, Federal Aviation Administration, Southwest Flight Standards District Office, 67 Wiley Post Airport, Bethany, Oklahoma 73008.)

E. Videotapes:

1. Identification and Application of Aircraft Hardware, ITP-G5, Program 1

2. Rivet Identification, ITP-S113

3. The Mechanic's Tool Box, ITP-G5, Program 2

4. Measuring and Layout Tools, ITP-G5, Program 3

5. Precision Measuring Instruments, the Micrometer Caliper, ITPS-119

6. Precision Measuring Instruments, the Vernier Caliper, ITPS-120

7. Importance and Principles of Aircraft Weight and Balance, ITP-G4, Program 2

8. Center of Gravity and Loading Computations, ITP-G4, Program 3

(NOTE: These videotapes are available from Aviation Maintenance Publishers, Inc., P.O. Box 36, 1000 College View Drive, Riverton, Wyoming 82501.)

F. Slides

1. Hand Tools

(NOTE: These slides are available from the National Safety Council, 444 North Michigan Avenue, Chicago, Illinois 60611.)

2. Torque Wrenches

(NOTE: These slides are available from Hobar Publications, 1305 Tiller Lane, St. Paul, Minnesota 55112.)

3. Micrometer Instruments

(NOTE: These slides are available from Industrial Training, Inc., 2023 Eastern Avenue, SE, P.O. Box 7186, Grand Rapids, Michigan 49510.)

G. Equipment and Tools

1. Aircraft with manufacturer's service manual and papers

2. Electrical auxiliary power unit

3. Bench vise

4. Drill vise and backup lock

5. Drill press

6. 1/2 inch high speed machine reamer

7. Tube pressure tester

8. Installation mock-up for aircraft engine with rigid and flexible fluid lines

9. Tube and hose assemblies for mock-up or engine

10. Certified aircraft scales and chocks

11. Certified electronic load cells

12. Aircraft jacks
13. Aircraft ramps
14. Aircraft tie-downs
15. Engine intake covers
16. Pitot tube and static port covers
17. Control battens for ailerons, rudders, and elevators
18. Two-way radio
19. Bull horn
20. 6 - 4 feet high stanchions
21. Air hoses and gages
22. 6-inch rule
23. AN bolt gage
24. Grip length gage
25. Thread pitch gage
26. Terminal gage
27. Steel rule
28. 25 foot steel tape
29. Surface plates
30. 1 inch vernier micrometer
31. Inside micrometer with extension rod
32. Depth micrometer with extension rod
33. 6-inch or 8-inch vernier caliper
34. Combination square head and blade
35. Machinist's square
36. Drill gages
37. Chalkline

38. 12 inch steel rule
39. Plum bob
40. Spirit level
41. 10 lb. fire extinguisher
42. Safety glasses
43. Ear protection
44. Pocket scribe
45. Center punch
46. Small 3 square file (triangular)
47. 10 inch hand file (double-cut)
48. 10 inch mill file (single-cut)
49. Hacksaw
50. Ball peen hammer
51. Duckbill pliers
52. Diagonal pliers
53. Needle nose pliers
54. Safety wire pliers
55. Number drills 30, 3, 50
56. Letter drills, F, U, Q
57. Fractional drills 31/64, 7/16, 25/64, 1/4, 5/16, 1/8
58. 82 degree countersink
59. 3/8 inch counterbore with 1/4-inch pilot
60. Tap handles, small and large
61. 5/16 - 1/8NC taper tap
62. 7/16-14NC taper tap
63. 7/16-20NF taper tap

64. 1/4 NPT tap

65. 1/4 NPT reamer

66. 3/8-24NF taper tap

67. Die stock

68. 7/16-20NF die (adjustable)

69. 1 inch #4 taper pin

70. Taper tap reamer with #4 morse taper

71. Set of end wrenches

72. 1/4 inch drive torque wrench

73. Set 1/4 inch drive sockets

74. Set open-end wrenches

75. Set allen wrenches

76. Set combination wrenches

77. Phillips screwdriver #2

78. 1/2 inch flat cold chisel or cable cutters

79. Nicropress swaging tool

80. Tubing cutter

81. Tube cutter with burring knife

82. Tube flaring tool

83. Deburring tool

84. Tube bender with 5/16 inch radius form block

85. Beading tool

86. Clamping tool

87. 37 degree flare tool

88. Flexible hose assembly tool or mating AN815 adapter

89. Support clamps

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H. Supplies and Materials

1. Assorted dowel pins with colored ends (5 per student)
2. 6-inch and 4-inch pipe, pre-machined
3. Steel or aluminum blocks, pre-machined
4. Steel bar, turned with 4 dimensioned, pre-machined
5. Project kit for G104-B #5
6. Hardware board and accessory box for G104-C #2 and #3
7. Material for marking taxi course
8. One large red flag
9. Shop supply layout stain
10. Shop supply soft brushes
11. Shop supply cutting oil
12. Shop supply masking tape
13. Shop supply grease
14. Shop supply light oil
15. Shop supply grease pencils
16. Shop supply fine grit sandpaper
17. Shop supply 500 grit wet or dry sandpaper
18. Shop supply lubriplate grease
19. Shop supply crocus cloth
20. Shop supply 5606 hydraulic fluid
21. Shop supply cold rolled steel or aluminum blocks
22. Shop supply aluminum tubing 3/8 inch gage
23. Shop supply 1/8 inch 7 x 7 carbon steel cable
24. Shop supply 5052 aluminum tubing 3/8 inch gage
25. Shop supply 3/8 O.D. aluminum or steel tubing

APPENDIX D

26. Shop supply 6061-T6 aluminum tubing

27. Shop supply 5052-0 1/4 inch aluminum tubing

28. Shop supply flexible hose

29. Shop supply 0.032 inch stainless steel safety wire

30. Shop supply 1/4 inch nylon rope

31. Shop supply cotter pins

32. Shop supply nicopress oval sleeves 28-3-M or 18-3-M (4 per student)

33. Shop supply 1/8 inch cable thimbles (4 per student)

34. Shop supply AN818-6 B-nuts (3 per student)

35. Shop supply AN819-6 sleeves (3 per student)

36. Shop supply flareless fittings MS-21918

37. Shop supply flareless sleeves and tube nuts (2 per student)

38. Shop supply flareless fitting type plug MS21923 (1 per student)

39. Shop supply 10/32 screws and nuts (10 per student)

40. Shop supply AN505-516-30

41. 7/16 inch rod (2 inches per student)

APPENDIX D

COURSE IMPLEMENTATION GUIDE

G105 - AVIATION ELECTRICITY AND ELECTRONICS

A. Project Guides:

1. G105-C - #1 Construct a Circuit from a Schematic Diagram
(Recommended: Students perform individually)

2. G105-C - #2 Determine Continuity of a Circuit
(Recommended: Students perform individually)

3. G105-C - #3 Analyze Resistors in a Circuit
(Recommended: Students perform individually)

4. G105-C - #4 Measure Direct Current Voltage
(Recommended: Students perform individually)

5. G105-C - #5 Measure Direct Current
(Recommended: Students perform individually)

6. G105-C - #6 Perform Circuit Analysis Using Ohm's Law
(Recommended: Students perform individually)

7. G105-C - #7 Perform Series Circuit Analysis Using Electrical Measuring Devices
(Recommended: Students perform individually)

8. G105-C - #8 Perform Parallel Circuit Analysis Using Electrical Measuring Devices
(Recommended: Students perform individually)

9. G105-E - #1 Inspect and Service a Lead-Acid Battery
(Recommended: Students perform individually)

10. G105-E - #2 Inspect and Service a Nickel-Cadmium Battery
(Recommended: Students perform individually)

B. References:

1. EA-ITP-G General Textbook

2. EA-ITP-GW General Workbook

3. AC 43.13-1A & 2A Acceptable Methods, Techniques, and Practices, Aircraft Inspection and Repair/Aircraft Alterations

(NOTE: These books are available from Aviation Maintenance Publishers, Inc., P.O. Box 36, 1000 College View Drive, Riverton, Wyoming 82501.)

4. Manufacturer's service manual

C. Videotapes:

1. Electron Theory, ITP-G2, Program 1

2. Sources of Electrical Energy, ITP-G2, Program 2

3. Units of Electrical Measurement, ITP-G2, Program 3

4. DC Circuit Elements, ITP-G2, Program 5

5. DC Circuit Arrangement, ITP-G2, Program 5

6. Principles of Alternating Circuit, ITP-G3, Program 1

7. Inductance, Capacitance, and Impedance, ITP-G3, Program 2

8. Theory and Testing of Lead-Acid Batteries, ITP-G2, Program 6

9. Theory and Testing of Nickel-Cadmium Batteries, ITP-G2, Program 7

(NOTE: These materials are available from Aviation Maintenance Publishers, Inc., P.O. Box 36, 1000 College View Drive, Riverton, Wyoming 82501.)

D. Equipment and Tools

1. Electrical project boards

2. Student multimeter

3. Constant current battery charger

4. 12 volt lead-acid aircraft battery

5. Rubber suction ball

6. Hydrometer

7. Thermometer

8. Cell puller

9. Ni-cad battery

10. Shorting straps

11. 1/4 inch drive torque wrench

12. Rubber gloves

13. Rubber apron

14. Safety glasses

15. Face shield

E. Supplies and Materials

1. Soft brushes

2. Clean shop rags and towels

3. Resistors* (per student)

4. Colored wires** (per student)

5. Black lead wires

6. Red lead wires

*RESISTORS

G105-C #1

1. R_1 - 47 Ω
2. R_2 - 560 Ω
3. R_3 - 1100 Ω
4. R_4 - 4700 Ω
5. R_5 - 3300 Ω
6. R_6 - 1000 Ω
7. R_7 - 1000 Ω
8. R_8 - 1500 Ω
9. R_9 - 1100 Ω
10. R_{10} - 470 Ω
11. R_{11} - 10,000 Ω
12. R_{12} - 390 Ω

G105-C #3

1. R_1 - 47 Ω
2. R_2 - 560 Ω
3. R_3 - 1100 Ω
4. R_4 - 4700 Ω
5. R_5 - 33,000 Ω

G105-C #4

1. R_1 - 1000 Ω
2. R_2 - 1500 Ω
3. R_3 - 1500 Ω
4. R_4 - 4600 Ω

G105-C #5

1. R_1 - 47 Ω
2. R_2 - 1100 Ω
3. R_3 - 1100 Ω
4. R_4 - 470 Ω

G105-C #6

1. R_1 - 1100 Ω, 1 watt
2. R_2 - 10,000 Ω, 1 watt
3. R_3 - 4700 Ω, 1 watt

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G105-C #7

1. R_1 - 47 Ω, 1 watt
2. R_2 - 560 Ω, 1 watt
3. R_3 - 47 Ω, 1 watt
4. R_4 - 1100 Ω, 1 watt

G105-C #8

1. R_1 - 390 Ω, 1 watt
2. R_2 - 1100 Ω, 1 watt
3. R_3 - 560 Ω, 1 watt

**Colored Wires - Each wire should have one collared and one non-collared.

1. Black
2. Brown
3. Red
4. Orange
5. Yellow
6. Green
7. Blue
8. Violet
9. Gray
10. White

Federal Aviation Regulations

PART 147

Aviation Maintenance Technician Schools

Published September 1974

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

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Introductory Note

Part 147 is codified under Subchapter H, Schools and Other Certificated Agencies, of Title 14 of the CODE OF FEDERAL REGULATIONS.

This FAA publication of the basic Part 147, effective September 17, 1962, incorporates Amendments 147-1 and 147-2 and any changes required by the Department of Transportation transition amendment.

Part 147—Aviation Maintenance Technician Schools

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Adoption of Subchapter H

Adopted: July 6, 1962 **Effective: September 17, 1962**

This amendment adds Subchapter H "Schools and Other Certificated Agencies" to Chapter I of Title 14 of the Code of Federal Regulations. The amendment is a part of the program of the Federal Aviation Agency to recodify its regulatory material into a new series of regulations called the "Federal Aviation Regulations" to replace the present "Civil Air Regulations" and "Regulations of the Administrator".

During the life of the recodification project, Chapter I of Title 14 may contain more than one Part bearing the same number. To differentiate between the two, the recodified Parts, such as the ones in this subchapter, will be labeled "[New]". The label will of course be dropped at the completion of the project as all of the regulations will be new.

Subchapter H [New] was published as a notice of proposed rule making in the Federal Register on April 19, 1962 (27 F.R. 3756), and circulated as Draft Release 62-16.

Some of the comments received recommend specific substantive changes to the regulations. Although some of the recommendations might, upon further study, appear to be meritorious, they cannot be adopted as a part of the recodification program. The purpose of the program is simply to streamline and clarify present regulatory language and to delete obsolete or redundant provisions. To attempt substantive change (other than minor, relaxatory ones that are completely noncontroversial) would delay the project and would be contrary to the ground rules specified for it in the Federal Register on November 15, 1961 (26 F.R. 10698) and Draft Release 61-25. However, all comments of this nature will be preserved and considered in any later substantive revision of the affected Parts. As a result, with one exception, no change has been made in the substance of the rules contained in the notice of proposed rule making. The exception is a clarification and relaxation of the rule relating to work performed off station by repair stations. A new subparagraph (d) has been added to section 145.51 to make it clear that a certificated repair station may under quality controlled circumstances perform maintenance or alteration at a place other than the repair station. One other major change, although not substantive, is the deletion of policy material formerly contained in CAM sections 53.40-1 and 53.41-1 relating to the details of mechanic school curricula, and their replacement by language based on CAR sections 53.40 and 53.41. The deleted material was not mandatory and will be considered for inclusion in the Agency Advisory Circular System.

Other comments received suggested changes in style or format or in technical wording. These comments were carefully considered and, where consistent with the style, format, and terminology of the recodification project, were adopted.

The definitions, abbreviations, and rules of construction contained in Part 1 [New] published in the Federal Register on May 15, 1962 (27 F.R. 4587) apply to the new Subchapter H.

Interested persons have been afforded an opportunity to participate in the making of this regulation, and due consideration has been given to all relevant matter presented. The Agency appreciates the cooperative spirit in which the public's comments were submitted.

In consideration of the foregoing, Chapter I of Title 14 is amended by deleting Parts 50, 51, 52, 53, and 54 and by adding Subchapter H [New]* reading as hereinafter set forth, effective September 17, 1962.

This amendment is made under the authority of sections 313(a), 314, 601, and 607 of the Federal Aviation Act of 1958 (49 U.S.C. 1354(a), 1355, 1421, and 1427).

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*Includes Part 141—Pilot Schools [New], Part 143—Ground Instructors [New], Part 145—Repair Stations [New], Part 147—Mechanic Schools [New], Part 149—Parachute Lofts [New].

Amendment 147-1

Cross Reference Corrections in FAR Parts 61, 65, 141 and 147

Adopted: April 4, 1967 **Effective: April 10, 1967**

(Published in 32 F.R. 5770, April 11, 1967)

These amendments update certain cross references in the Federal Aviation Regulations and make other miscellaneous corrections.

At the time of the recodification, it was necessary to include in the Federal Aviation Regulations cross references to the Civil Air Regulations or Special Civil Air Regulations where the referenced provision had not yet been recodified. These amendments update those cross references not previously updated. No substantive change is involved in these amendments. In some instances, the cross references as updated herein have been anticipated in compilations and reprints of the respective Parts of the regulations.

In addition, the term "Federal Air Surgeon" is substituted for the term "Civil Air Surgeon" in § 11.55 to correctly state the title of that official.

Since this amendment does not involve any substantive change and does not impose a burden on any person, notice and public procedure thereon are unnecessary, and the amendment may be made effective immediately.

In consideration of the foregoing, Chapter I of Title 14 is amended, effective April 10, 1967.

These amendments are made under the authority of section 313(a) of the Federal Aviation Act of 1958 (49 U.S.C. 1354(a)).

Amendment 147-2

Name, Operations, and Curriculum

Adopted: March 27, 1970 **Effective: May 3, 1970**

(Published in 35 F.R. 5331, April 3, 1970)

The purpose of these amendments to Part 147 of the Federal Aviation Regulations is to change the name of mechanic schools certificated under that Part to "aviation maintenance technician schools"; provide more specific guidelines for the certification and operations of these schools; and provide new minimum curriculum requirements, for both certification and operations purposes, that reflect technological advancements of the aviation industry. The amendments to Part 65 reflect the changed name of the schools, and remove inconsistent or obsolete provisions.

Interested persons have been afforded an opportunity to participate in the making of these amendments by a notice of proposed rule making (Notice 69-6) issued on February 26, 1969, and published in the Federal Register on March 4, 1969 (34 F.R. 3751). Due consideration has been given to all comments presented in response to that Notice.

Fifty-nine comments were received on the Notice, the majority of which favored the proposals. A number of the comments either objected to particular items proposed, or suggested alternatives.

(1) *Change in name.* As proposed in the Notice, these amendments substitute the designation "aviation maintenance technician school" for "mechanic school" in the title and text of Part 147. Most of the commentators favored this change of name, stating that it will reflect a more professional image and be more descriptive of the mechanic's job in today's advanced technology. One commentator proposed adding the phrase "FAA approved course" to distinguish this course from non-approved courses. However, this change is considered to be unnecessary.

(2) *More specific guidelines for certification and operations of schools.*

(a) *As to certification.* Two commentators opposed eliminating the requirement for test clubs for running-in engines, in § 147.15, asserting that test clubs are required to properly perform certain engine maintenance testing functions. The reason given in

the Notice for the proposed rule change is that current engine manufacturers' overhaul procedures do not require using test clubs for running-in engines after overhaul. It was not intended to preclude the use of test clubs in properly performing engine maintenance testing functions. However, to avoid possible confusion and accommodate the use of test clubs, where related to schools' specific curriculum in use, the term "suitable facilities for running engines" is substituted in these amendments for the proposed requirement of "separate space with permanent, portable, or mobile test stands."

Four commentators disapproved of the use of the word "suitable" (proposed for use in additional paragraphs of § 147.15), asserting that the word lacks specificity and therefore is subject to a wide range of individual interpretations. The term "suitable" has previously appeared in six paragraphs of this section. As issued, the Notice merely proposed application of this flexibility to the other requirements for facilities and equipment.

One commentator stated that the proposed changes do not place enough emphasis on the regulation of the classroom noise level. The noise level problem is met by the new requirement for an enclosed separate classroom suitable for teaching theory classes. Two commentators stated that the proposed changes should allow for provision of a space consisting of a classroom and a laboratory. However, to have laboratory and classroom space together would not improve the capability for noise control at the classroom level.

A number of comments were directed to the proposal that under § 147.23 a school must provide at least one instructor, holding appropriate mechanic certificates and ratings, for each 25 students in each shop or laboratory class. Thus, one commentator suggested that the ratio be no more than 20 students to one instructor in theory classes and 12 students to one instructor in shop and laboratory classes, asserting that a ratio of 25 students to one instructor in a shop or laboratory class is too many students for the instructor to control. On the other hand, several commentators opposed any limitation of this kind, characterizing it as too restrictive. The decision to have a specified ratio of students to instructors resulted from research and study, as well as from practical experience. The 25 to 1 ratio represents an upper limit, and it is not meant to suggest an ideal ratio. In fact, some schools normally employ ratios ranging from 20 to 1 down to 12 to 1.

(b) *As to operations.* Most of the commentators agreed with the proposed amendments to § 147.31 providing that a school may not credit a student with training received at that school prior to certification, and that a student may receive credit for previous experience to the extent that the experience is comparable to the required curriculum subjects. A few comments disagreed. However, as stated in the Notice, this amendment should encourage schools to seek certification without delay.

A large number of commentators favored the proposed amendment to § 147.31 requiring schools to use an approved system for determining final course grades, and for recording and controlling student attendance. Some commentators expressed concern that the FAA standard of acceptability might not be standard among all inspectors; or that it difficult to have a rigid accounting of student class attendance at a collegiate-type school.

The proposed changes, requiring only that each school establish an approved system that is capable of controlling and recording attendance, without complete standardization, is considered sufficient to assure uniformity, as stated in the Notice.

A number of comments concerned the proposal to add to § 147.31 a provision that a school may not allow a student to attend classes of instruction more than 8 hours in any day or more than 6 days or 40 hours in any 7-day period. Several commentators asserted that this provision would prevent the student from attending make-up sessions, and other comments asserted that it would be desirable to allow the schools to give instruction for 48 hours in any 7-day period, as many students do not work and can carry the load. Other commentators suggested that the only limitation on student attendance should be the student's ability to maintain a 70% grade in all required subjects, or that students should not be allowed to receive course credit for attendance at courses other than during regularly scheduled hours of instruction, or that it should be possible to make up absences occurring because of sickness, strikes, holidays, and snow days. After further consideration, and in view of the comments and the fact that the schools

may not require a student to attend classes of instruction for more than a specified number of hours, it has been determined not to implement this proposal.

Three commentators on the proposal to strike from § 147.35 the present requirement that the certificate issued (whether a certificate of completion or graduation) show the student's average grades, but to provide that the certificate reflect the student's standards of performance during the entire curriculum, asserted that such a showing is unnecessary since such a record is available from other sources. After further consideration and in view of these comments, it has been determined not to require the certificate to show either the average grades or standard of performance.

(3) *Minimum curriculum requirements.* The majority of the commentators agreed with the proposal, by amendments to § 147.21 and addition of appendixes, to increase the number and type of items and subjects taught, and to indicate the levels of proficiency at which the items of subjects must be taught. Several comments questioned whether the general curriculum subjects must be taught as a separate curriculum from the airframe and powerplant curriculum subjects. This is not intended. The purpose of listing the general curriculum subjects separately is merely to avoid repetition.

A number of commentators opposed increasing the required numbers of hours of instruction. Prihcipal comments stated that post-graduate high schools, technical institutes, and community colleges that operate on a 2-year curriculum would have problems with the increase in curriculum hours; and that the requirement that the curriculum show the required practical projects to be completed will be hard to enforce, and that it is impractical to list required projects for each school because of the changing nature of the aeronautical industry and the equipment involved.

As stated in the Notice, a national study of the aviation mechanics occupations was used as the basis for developing these curriculums. Approximately 507 tasks commonly performed by mechanics were analyzed along with the results of a survey. The information collected showed the proportion of over 18,000 certificated mechanics who performed each task, the frequency with which the task was performed, and the degree of industry training involved. A National Advisory Committee, consisting of 15 members representing a broad segment of the aviation community, assisted in determining the tasks to be performed and the level of proficiency required of a student at a certificated school.

After careful review of all these suggestions, Appendix A is adopted as proposed. Appendix B is adopted with a change under the subject "Basic Electricity" that strikes out the words "conductivity and," so that the sentence reads "calculate and measure electrical power." Appendix C is adopted with the following changes: Item 36 is redesignated as Item 37 and the teaching level is raised to level 2, Item 37 is redesignated as Item 36 and the teaching level remains at level 1. Appendix D is adopted with one change: the teaching level of Item 1 is changed from level 2 to level 1.

The Notice proposed that each school have a maximum of 2 years from the effective date of these amendments to change to the new curriculum. Two commentators felt that a 2-year period would be inadequate for a school to decide whether it desires to retain its certification, and suggested a 5-year period. However, the 2-year period is considered a sufficiently long period for the purpose.

The amendments to Part 65 remove obsolete or inconsistent provisions. These amendments are minor in nature, effect no substantive change and are ones in which the public is not particularly interested. Notice and public procedure thereon are therefore unnecessary. The words "certificated mechanic school" are changed to "aviation maintenance technician school" in §§ 65.77 and 65.80, to conform with the new name in Part 147. In addition, these amendments add the words "or a certificate of completion" after the words "graduation certificate" in § 65.77 to conform with the change in Part 147. Also, the words "final phase of his training in the course curriculum" in § 65.80 are changed to "final subjects of his training in the approved curriculum" to conform with the change in Part 147.

In consideration of the foregoing, Parts 65 and 147 of the Federal Aviation Regulations are amended, effective May 3, 1970.

(Sections 313(a), 601, and 607, Federal Aviation Act of 1958; 49 U.S.C. 1354(a), 1421, 1427. Section 6(c) of the Department of Transportation Act; 49 U.S.C. 1655(c)).

Part 147—Aviation Maintenance Technician Schools

Subpart A—General

§ 147.1 Applicability.

This Part prescribes the requirements for issuing aviation maintenance technician school certificates and associated ratings and the general operating rules for the holders of those certificates and ratings.

§ 147.3 Certificate required.

(a) No person may operate as a certificated aviation maintenance technician school without, or in violation of, an aviation maintenance technician school certificate issued under this Part.

(b) After May 2, 1970, each person holding a valid mechanic school certificate shall be considered to hold an aviation maintenance technician school certificate.

§147.5 Application and issue.

(a) An application for a certificate and rating, or for an additional rating, under this Part is made on a form and in a manner prescribed by the Administrator, and submitted with—

(1) A description of the proposed curriculum;

(2) A list of the facilities and materials to be used (with photographs of the facilities, if possible);

(3) A list of its instructors, including the kind of certificate and ratings held, the certificate number, and the subjects to be taught by each; and

(4) A statement of the maximum number of students it expects to teach at any one time.

(b) An applicant who meets the requirements of this Part is entitled to an aviation maintenance technician school certificate and associated ratings prescribing such operations specifications and limitations as are necessary in the interests of safety.

§ 147.7 Duration of certificates.

(a) An aviation maintenance technician school certificate or rating is effective until it is surrendered, suspended, or revoked.

(b) The holder of a certificate that is surrendered, suspended, or revoked, shall return it to the Administrator.

(c) Each holder of an aviation maintenance technician school certificate issued before May 3, 1970, may, before May 3, 1972, change his approved curriculum to conform with § 147.21 and have it approved. If the holder does not sooner apply for approval, his certificate expires on the latter date.

Subpart B—Certification Requirements

§ 147.11 Ratings.

The following ratings are issued under this Part:

(a) Airframe.

(b) Powerplant.

(c) Airframe and powerplant.

§ 147.13 Facilities, equipment, and material requirements.

An applicant for an aviation maintenance technician school certificate and rating, or for an additional rating, must have at least the facilities, equipment, and materials specified in §§ 147.15 through 147.19 that are appropriate to the rating he seeks.

§ 147.15 Space requirements.

An applicant for an aviation maintenance technican school certificate and rating, or for an additional rating, must have such of the following properly heated, lighted, and ventilated facilities as are appropriate to the rating he seeks and as the Administrator determines

are approriate for the maximum number of students expected to be taught at any time:

(a) An enclosed classroom, separate from other space and facilities, suitable for teaching theory classes.

(b) Suitable facilities, either central or located in training areas, arranged to assure proper separation from the working space for the segregation and protection of parts, tools, materials, and similar articles.

(c) Suitable separate space for doping and paint spraying.

(d) Suitable separate space equipped with washtank and degreasing equipment with air pressure, or other adequate cleaning equipment.

(e) Suitable facilities for running engines.

(f) Suitable separate space, with adequate equipment, including benches, tables, and instruments, to disassemble, repair, assemble, test, service, and inspect—

(1) Ignition, electrical equipment, and appliances;

(2) Carburetors and fuel systems; and

(3) Hydraulic and vacuum systems for aircraft, aircraft engines, and their appliances.

(g) Suitable space, with adequate equipment including tables, benches, horses, stands, and jacks, for disassembling, inspecting, and rigging aircraft.

(h) Suitable space, with adequate equipment, for disassembling, inspecting, overhauling, assembling, troubleshooting, and timing engines.

§ 147.17 Instructional equipment requirements.

(a) An applicant for an aviation maintenance technician school certificate and rating, or for an additional rating, must have such of the following instructional equipment as is appropriate to the rating he seeks:

(1) Various kinds of airframe structures, airframe systems and components, powerplants, and powerplant systems and components (including propellers), of a quantity and type suitable to complete the practical projects required by its approved curriculums.

(2) At least one aircraft of a type currently certificated by FAA for private or commercial operation, with powerplant, propeller, instruments, two-way radio, landing lights, and other equipment and accessories on which a mechanic might be required to work and with which he should be familiar.

(b) The equipment required by paragraph (a) of this section need not be in an airworthy condition. However, if it was damaged, it must have been repaired enough for complete assembly.

(c) Airframes, powerplants, propellers, appliances, and components thereof, on which instruction is to be given, and from which practical working experience is to be gained, must be so diversified as to show the different methods of construction, assembly, inspection, and operation when installed in an aircraft for use. There must be enough units so that not more than eight students will work on any one unit at a time.

(d) If the aircraft used for instructional purposes does not have retractable landing gear and wing flaps, the school must provide training aids, or operational mock-ups of them.

§ 147.19 Material, tools, and shop equipment requirements.

An applicant for an aviation maintenance technician school certificate and rating, or for an additional rating, must have an adequate supply of material and tools, and such of the shop equipment, special tools, and other miscellaneous tools and equipment as are appropriate to the approved curriculum of the school and are used in constructing and maintaining aircraft, to assure that each student will be properly instructed. The tools and shop equipment must be in satisfactory working condition and of the proper kind for the purpose for which they are to be used.

§ 147.21 General curriculum requirements.

(a) An applicant for an aviation maintenance technician school certificate and rating, or for an additional rating, must have an approved curriculum that is designated to qualify

his students to perform the duties of a mechanic for a particular rating or ratings.

(b) The curriculum must offer at least the following number of hours of instruction for the rating shown:

(1) Airframe—1150 hours (400 general plus 750 airframe).

(2) Powerplant—1150 hours (400 general plus 750 powerplant).

(3) Combined airframe and powerplant—1900 hours (400 general plus 750 airframe and 750 powerplant).

(c) The curriculum must cover the subjects and items prescribed in Appendix B, and in Appendix C or D as applicable. Each item must be taught at the indicated level of proficiency, as defined in Appendix A.

(d) The curriculum must show—

(1) The required practical projects to be completed;

(2) For each subject, the proportions of theory and other instruction to be given; and

(3) A schedule of the required school tests to be given.

(e) The curriculum must be so designed that at least 50 percent of the total curriculum time is spent in shop and laboratory instruction.

§ 147.23 Instructor requirements.

An applicant for an aviation maintenance technician school certificate and rating, or for an additional rating, must provide the number of instructors holding appropriate mechanic certificates and ratings that the Administrator determines necessary to provide adequate instruction and supervision of the students, including at least 1 such instructor for each 25 students in each shop or laboratory class. However, the applicant may provide specialized instructors, who are not certificated mechanics, to teach only mathematics, physics, drawings, and similar subjects.

Subpart C—Operating Rules

§ 147.31 Attendance and enrollment, tests, and credit for prior instruction or experience.

(a) A certificated aviation maintenance technician school may not require any student to attend classes of instruction more than 8 hours in any day or more than 6 days or 40 hours in any 7-day period.

(b) Each school shall give an appropriate test to each student who completes a subject at that school.

(c) A school may not graduate a student unless he has completed all of the appropriate curriculum requirements. However, the school may credit a student with instruction or previous experience as follows:

(1) A school may credit a student with instruction he has satisfactorily completed at an accredited college, State-owned vocational or trade school, or military technical specialty school, or at an aviation maintenance technician school other than the crediting school before the latter was certificated. It may determine the amount of credit to be allowed by giving the applicant an entrance test equal to the one given to students who complete a comparable required curriculum subject at the school, or by an authenticated transcript of his grades from his former school, showing the curriculum in which he was enrolled, the hours of attendance, and his grades in each subject. However, in the case of an applicant with military technical specialty training, it may determine the amount of credit only on the basis of an entrance test.

(2) A school may credit a student with previous mechanic experience comparable to required curriculum subjects. It must determine the amount of credit to be allowed by documents verifying that experience, and by giving the student a test equal to the one given to students who complete the comparable required curriculum subject at the school.

(d) A school may not have more students enrolled than the number stated in its application for a certificate, unless it amends its application and has it approved.

(e) A school shall use an approved system for determining final course grades, and for recording and controlling student attendance. The system must show hours of absence al-

lowed, and makeup provisions for classes missed.

§ 147.33 Records.

(a) Each certificated aviation maintenance technician school shall keep a current record of each student enrolled, showing—

(1) His attendance, tests, and grades received on the subjects required by this Part;

(2) The instruction credited to him under § 147.31(c), if any; and

(3) The authenticated transcript of his grades from that school.

It shall retain the record for at least two years after the end of the student's enrollment, and shall make each record available for inspection by the Administrator during that period.

(b) Each school shall keep a current progress chart or individual progress record for each of its students, showing the practical projects or laboratory work completed, or to be completed, by the student in each subject.

§ 147.35 Transcripts and graduation certificates.

(a) Each certificated aviation maintenance technician school shall give a transcript of his grades to each student who is graduated from that school or who leaves it before being graduated. An official of the school shall authenticate the transcript. The transcript must state the curriculum in which the student was enrolled, whether the student satisfactorily completed that curriculum, and the final grades he received.

(b) Each school shall give a graduation certificate or certificate of completion to each student that it graduates. An official of the school shall authenticate the certificate. The certificate must show the date of graduation and the approved curriculum title.

§ 147.36 Maintenance of instructor requirements.

Each certificated aviation maintenance technician school shall, after certification or addition of a rating, continue to provide the number of instructors holding appropriate mechanic certificates and ratings that the Administrator determines necessary to provide adequate instruction and supervision of the students, including at least 1 such instructor for each 25 students in each shop or laboratory class. The school may continue to provide specialized instructors, who are not certificated mechanics, to teach only mathematics, physics, drawing, and similar subjects.

§ 147.37 Maintenance of facilities, equipment, and material.

(a) Each certificated aviation maintenance technician school shall provide facilities, equipment, and material equal to the standards currently required for the issue of the certificate and rating that it holds.

(b) A school may not make a substantial change in facilities, equipment, or material that have been approved for a particular curriculum, unless that change is approved in advance.

§ 147.38 Maintenance of curriculum requirements.

(a) Each certificated aviation maintenance technician school shall adhere to its approved curriculum.

(b) A school may not change its approved curriculum unless the change is approved in advance.

§ 147.38a Quality of instruction.

Each certificated aviation maintenance technician school shall provide instruction of such quality that, of its graduates of a curriculum for each rating who apply for a mechanic certificate or additional rating within 60 days after they are graduated, the percentage of those passing the applicable FAA written test on their first attempt during any period of 24 calendar months is at least the percentage figured as follows:

(a) For a school graduating fewer than 51 students during that period—the national passing norm minus the number 20.

(b) For a school graduating at least 51, but fewer than 201, students during that period—the national passing norm minus the number 15.

(c) For a school graduating more than 200 students during that period—the national passing norm minus the number 10.

As used in this section, "national passing norm" is the number representing the percentage of all graduates (of a curriculum for a particular rating) of all certificated aviation maintenance technician schools who apply for a mechanic certificate or additional rating within 60 days after they are graduated and pass the applicable FAA written test on their first attempt during the period of 24 calendar months described in this section.

§ 147.39 Display of certificate.

Each holder of an aviation maintenance technician school certificate and ratings shall display them at a place in the school that is normally accessible to the public and is not obscured. The certificate must be available for inspection by the Administrator.

§ 147.41 Change of location.

The holder of an aviation maintenance technician school certificate may not make any change in the school's location unless the change is approved in advance. If the holder desires to change the location he shall notify the Administrator, in writing, at least 30 days before the date the change is contemplated. If he changes its location without approval, the certificate is revoked.

§ 147.43 Inspection.

The Administrator may, at any time, inspect an aviation maintenance technician school to determine its compliance with this Part. Such an inspection is normally made once each six months to determine if the school continues to meet the requirements under which it was originally certificated. After such an inspection is made, the school is notified, in writing, of any deficiencies found during the inspection. Other informal inspections may be made from time to time.

§ 147.45 Advertising.

(a) A certificated aviation maintenance technician school may not make any statement relating to itself that is false or is designed to mislead any person considering enrollment therein.

(b) Whenever an aviation maintenance technician school indicates in advertising that it is a certificated school, it shall clearly distinguish between its approved courses and those that are not approved.

Appendix A

Curriculum Requirements

This appendix defines terms used in Appendixes B, C, and D of this Part, and describes the levels of proficiency at which items under each subject in each curriculum must be taught, as outlined in Appendixes B, C, and D.

(a) *Definitions.* As used in Appendixes B, C, and D:

(1) "Inspect" means to examine by sight and touch.

(2) "Check" means to verify proper operation.

(3) "Troubleshoot" means to analyze and identify malfunctions.

(4) "Service" means to perform functions that assure continued operation.

(5) "Repair" means to correct a defective condition. Repair of an airframe or powerplant system includes component replacement and adjustment, but not component repair.

(6) "Overhaul" means to disassemble, inspect, repair as necessary, and check.

(b) *Teaching levels.*

(1) Level 1 requires:

(i) Knowledge of general principles, but no practical application.

(ii) No development of manipulative skill.

(iii) Instruction by lecture, demonstration, and discussion.

(2) Level 2 requires:

(i) Knowledge of general principles, and limited practical application.

(ii) Development of sufficient manipulative skill to perform basic operations.

(iii) Instruction by lecture, demonstration, discussion, and limited practical application.

(3) Level 3 requires:

(i) Knowledge of general principles, and performance of a high degree of practical application.

(ii) Development of sufficient manipulative skill to accomplish return to service.

(iii) Instruction by lecture, demonstration, discussion, and a high degree of practical application.

Appendix B

General Curriculum Subjects

This appendix lists the subjects required in at least 400 hours in general curriculum subjects.

The number in parentheses before each item listed under each subject heading indicates the level of proficiency at which that item must be taught.

A. BASIC ELECTRICITY

Teaching Level

(1) 1. Measure capacitance and inductance.
(2) 2. Calculate and measure electrical power.
(3) 3. Measure voltage, current, resistance, continuity, and leakage.
(3) 4. Determine the relationship of voltage, current, and resistance in electrical circuits.
(3) 5. Read and interpret electrical circuit diagrams.
(3) 6. Inspect and service batteries.

B. AIRCRAFT DRAWINGS

(2) 7. Use drawings, symbols, and schematic diagrams.
(3) 8. Draw sketches of repairs and alterations.
(3) 9. Use blueprint information.
(3) 10. Use graphs and charts.

C. WEIGHT AND BALANCE

(2) 11. Weigh aircraft.
(3) 12. Perform complete weight-and-balance check and record data.

D. FLUID LINES AND FITTINGS

(3) 13. Fabricate and install rigid and flexible fluid lines and fittings.

E. MATERIALS AND PROCESSES

(1) 14. Identify and select appropriate nondestructive testing methods.
(2) 15. Perform penetrant, chemical etching, and magnetic particle inspections.
(2) 16. Perform basic heat-treating processes.
(3) 17. Identify and select aircraft hardware and materials.

Teaching Level

(3) 18. Inspect and check welds.
(3) 19. Perform precision measurements.

F. GROUND OPERATION AND SERVICING

(2) 20. Start, ground operate, move, service, and secure aircraft.
(2) 21. Identify and select fuels.

G. CLEANING AND CORROSION CONTROL

(3) 22. Identify and select cleaning materials.
(3) 23. Perform aircraft cleaning and corrosion control.

H. MATHEMATICS

(1) 24. Extract roots and raise numbers to a given power.
(2) 25. Determine areas and volumes of various geometrical shapes.
(3) 26. Solve ratio, proportion, and percentage problems.
(3) 27. Perform algebraic operations involving addition, subtraction, multiplication, and division of positive and negative numbers.

I. MAINTENANCE FORMS AND RECORDS

(3) 28. Write descriptions of aircraft condition and work performed.
(3) 29. Complete required maintenance forms, records, and inspection reports.

J. BASIC PHYSICS

(2) 30. Use the principles of simple machines; sound, fluid, and heat dynamics.

K. MAINTENANCE PUBLICATIONS

(3) 31. Select and use FAA and manufacturer's aircraft maintenance specifications, data sheets, manuals, and publications, and related Federal Aviation Regulations.
(3) 32. Read technical data.

L. MECHANIC PRIVILEGES AND LIMITATIONS

(3) 33. Exercise mechanic privileges within the limitations prescribed by Part 65 of this chapter.

Appendix C

Airframe Curriculum Subjects

This appendix lists the subjects required in at least 750 hours of each airframe curriculum, in addition to at least 400 hours in general curriculum subjects.

The number in parentheses before each item listed under each subject heading indicates the level of proficiency at which that item must be taught.

I. AIRFRAME STRUCTURES

A. WOOD STRUCTURES

Teaching Level

(1) 1. Service and repair wood structures.
(2) 2. Identify wood defects.
(2) 3. Inspect wood structures.

B. AIRCRAFT COVERING

(1) 4. Select and apply fabric and fiberglass covering materials.
(3) 5. Inspect, test, and repair fabric and fiberglass.

C. AIRCRAFT FINISHES

(1) 6. Apply trim, letters, and touchup paint.
(2) 7. Identify and select aircraft finishing materials.
(2) 8. Apply paint and dope.
(2) 9. Inspect finishes and identify defects.

D. SHEET METAL STRUCTURES

(2) 10. Install special rivets and fasteners.
(2) 11. Inspect bonded structures.
(2) 12. Inspect and repair plastics, honeycomb, and laminated structures.
(2) 13. Inspect, check, service, and repair windows doors, and interior furnishings
(3) 14. Inspect and repair sheet-metal structures.
(3) 15. Install conventional rivets.
(3) 16. Hand form, lay out, and bend sheet metal.

E. WELDING

(1) 17. Weld magnesium and titanium.
(1) 18. Solder stainless steel.
(1) 19. Fabricate tubular structures.

Teaching Level

(2) 20. Solder, braze, gas-weld, and arc-weld steel.
(2) 21. Weld aluminum and stainless steel.

F. ASSEMBLY AND RIGGING

(1) 22. Rig rotary-wing aircraft.
(2) 23. Rig fixed-wing aircraft.
(2) 24. Check alignment of structures.
(3) 25. Assemble aircraft.
(3) 26. Balance and rig movable surfaces.
(3) 27. Jack aircraft.

G. AIRFRAME INSPECTION

(3) 28. Perform airframe conformity and airworthiness inspections.

II. AIRFRAME SYSTEMS AND COMPONENTS

A. AIRCRAFT LANDING GEAR SYSTEMS

(3) 29. Inspect, check, service, and repair landing gear, retraction systems, shock struts, brakes, wheels, tires, and steering systems.

B. HYDRAULIC AND PNEUMATIC POWER SYSTEMS

(2) 30. Repair hydraulic and pneumatic power systems components.
(3) 31. Identify and select hydraulic fluids.
(3) 32. Inspect, check, service, troubleshoot, and repair hydraulic and pneumatic power systems.

C. CABIN ATMOSPHERE CONTROL SYSTEMS

(1) 33. Repair heating, cooling, air-conditioning, pressurization, and oxygen system components.
(1) 34. Inspect, check, troubleshoot, service, and repair heating, cooling, air-conditioning, and pressurization systems.
(2) 35. Inspect, check, troubleshoot, service and repair oxygen systems.

D. AIRCRAFT INSTRUMENT SYSTEMS

Teaching Level

(1) 36. Inspect, check, service, troubleshoot and repair heading, speed, altitude, time, attitude, temperature, pressure and position indicating systems.

(2) 37. Install instruments.

E. COMMUNICATION AND NAVIGATION SYSTEMS

(1) 38. Inspect, check, and service auto-pilot and approach control systems.

(1) 39. Inspect, check, and service aircraft electronic communication and navigation systems.

(2) 40. Inspect and repair antenna and electronic equipment installations.

F. AIRCRAFT FUEL SYSTEMS

(1) 41. Check and service fuel dump systems.

(1) 42. Perform fuel management, transfer, and defueling.

(1) 43. Inspect, check, and repair pressure fueling systems.

(2) 44. Repair aircraft fuel system components.

(2) 45. Inspect and repair fluid quantity indicating systems.

(2) 46. Troubleshoot, service, and repair fluid pressure and temperature warning systems.

(3) 47. Inspect, check, service, troubleshoot, and repair aircraft fuel systems.

G. AIRCRAFT ELECTRICAL SYSTEMS

Teaching Level

(2) 48. Repair aircraft electrical system components.

(3) 49. Install, check, and service airframe electrical wiring, controls, switches, indicators, and protective devices.

(3) 50. Inspect, check, troubleshoot, service and repair alternating current and direct current electrical systems.

H. POSITION AND WARNING SYSTEMS

(1) 51. Inspect, check, and service speed- and takeoff-warning systems, electrical brake controls, and antiskid systems.

(3) 52. Inspect, check, troubleshoot, service, and repair landing gear position indicating and warning systems.

I. ICE AND RAIN CONTROL SYSTEMS

(2) 53. Inspect, check, troubleshoot, service, and repair airframe ice and rain control systems.

J. FIRE PROTECTION SYSTEMS

(1) 54. Inspect, check, and service smoke and carbon monoxide detection systems.

(3) 55. Inspect, check, service, troubleshoot, and repair aircraft fire detection and extinguishing systems.

Appendix D

Powerplant Curriculum Subjects

This appendix lists the subjects required in at least 750 hours of each powerplant curriculum, in addition to at least 400 hours in general curriculum subjects.

The number in parenthese before each item listed under each subject heading indicates the level of proficiency at which that item must be taught.

I. POWERPLANT THEORY AND MAINTENANCE

A. RECIPROCATING ENGINES

Teaching Level

(1) 1. Inspect and repair 14-cylinder or larger radial engine.

(2) 2. Overhaul reciprocating engine.

(3) 3. Inspect, check, service, and repair opposed and radial engines and reciprocating engine installations.

(3) 4. Install, troubleshoot, and remove reciprocating engines.

B. TURBINE ENGINES

(2) 5. Overhaul turbine engine.

(2) 6. Inspect, check, service, and repair turbine engines and turbine engine installations.

(2) 7. Install, troubleshoot, and remove turbine engines.

C. ENGINE INSPECTION

(3) 8. Perform powerplant conformity and airworthiness inspections.

II. POWERPLANT SYSTEMS AND COMPONENTS

A. ENGINE INSTRUMENT SYSTEMS

(2) 9. Troubleshoot, service, and repair fluid rate-of-flow indicating systems.

(3) 10. Inspect, check, service, troubleshoot, and repair engine temperature, pressure, and r.p.m. indicating systems.

B. ENGINE FIRE PROTECTION SYSTEMS

(3) 11. Inspect, check, service, troubleshoot, and repair engine fire detection and extinguishing systems.

C. ENGINE ELECTRICAL SYSTEMS

Teaching Level

(2) 12. Repair engine electrical system components.

(3) 13. Install, check, and service engine electrical wiring, controls, switches, indicators, and protective devices.

D. LUBRICATION SYSTEMS

(2) 14. Identify and select lubricants.

(2) 15. Repair engine lubrication system components.

(3) 16. Inspect, check, service, troubleshoot, and repair engine lubrication systems.

E. IGNITION SYSTEMS

(2) 17. Overhaul magneto and ignition harness.

(2) 18. Repair engine ignition system components.

(3) 19. Inspect, check, service, troubleshoot, and repair reciprocating and turbine engine ignition systems.

F. FUEL METERING SYSTEMS

(1) 20. Inspect, check, and service water injection systems.

(2) 21. Overhaul carburetor.

(2) 22. Repair engine fuel metering system components.

(3) 23. Inspect, check, service, troubleshoot, and repair reciprocating and turbine engine fuel metering systems.

G. ENGINE FUEL SYSTEMS

(2) 24. Repair engine fuel system components.

(3) 25. Inspect, check, service, troubleshoot, and repair engine fuel systems.

H. INDUCTION SYSTEMS

(2) 26. Inspect, check, troubleshoot, service, and repair engine ice and rain control systems.

(2) 27. Inspect, check, service, and repair heat exchangers and superchargers.

Teaching Level

(3) 28. Inspect, check, service, and repair carburetor air intake and induction manifolds.

I. ENGINE COOLING SYSTEMS

(2) 29. Repair engine cooling system components.

(3) 30. Inspect, check, troubleshoot, service, and repair engine cooling systems.

J. ENGINE EXHAUST SYSTEMS

(2) 31. Repair engine exhaust system components.

(3) 32. Inspect, check, troubleshoot, service, and repair engine exhaust systems.

K. PROPELLERS

Teaching Level

(1) 33. Inspect, check, service, and repair propeller synchronizing and ice control systems.

(2) 34. Identify and select propeller lubricants.

(2) 35. Balance propellers.

(2) 36. Repair propeller control system components.

(3) 37. Inspect, check, service, and repair fixed-pitch, constant-speed, and feathering propellers, and propeller governing systems.

(3) 38. Install, troubleshoot, and remove propellers.

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